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MODULAR SIMULATOR SYSTEM (MSS)

SYSTEM/SEGMENT SPECIFICATION FOR THE GENERIC MODULAR SIMULATOR SYSTEM - INSTRUCTOR/ OPERATOR STATION MODULE VOLUME 12

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AUGUST 1993

FINAL REPORT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

SYSTEMS ENGINEERING DIVISION
AERONAUTICAL SYSTEMS CENTER
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13. ABSTRACT *(Maximum 200 words)*

This is the Instructor/Operator Station portion of the generic Modular Simulator System (MSS) specification. It is designed to be tailored to specify the requirements for a specific aircraft training device or family of aircraft training devices. This specification contains specific tailoring instructions for each paragraph. When the tailoring process is complete, the italicized tailoring instructions should have been replaced by application specific text or deleted from the specification. It is suggested that the user read the "Modular Simulator Engineering Guide" and the "Modular Simulator Management Guide" prior to tailoring this volume.

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PREFACE

This generic Modular Simulator System (MSS) segment specification has been developed in accordance with DI-CMAN-80008A, Data Item Description for System/Segment Specifications. This specification meets or exceeds the requirements for MIL-STD-490, Type A, specifications. This specification is designed to be tailored to specify the requirements for a specific aircraft training device or family of aircraft training devices. Training devices may consist of Weapons System Trainers (WST), Operational Flight Trainers (OFT), Cockpit Procedures Trainers (CPT), Part Task trainers (PTT), etc.

Tailoring will be necessary to meet specific application requirements. The tailoring must be accomplished so as not to violate the goals and intent of the MSS concept. It is assumed that the user of this document has a familiarity with the MSS design concepts and architecture, the application aircraft training requirements, and general working knowledge of aircraft training systems. It is suggested that the user read the "Modular Simulator System Engineering Design Guide (D495-10440-1) and the "Modular Simulator System Management Guide" (D495-10439-1 prior to tailoring this specification. These guides provide an overview of the MSS architecture, an in-depth discussion on its application, and lessons learned from previous applications.

Each segment in the MSS architecture provides a portion of the overall system functionality. Similar functions and operations were grouped in each segment based on past experience, areas of design expertise, and management of intersegment communication. To promote reuse of the segments and gain the maximum benefits of using the MSS approach, it is suggested that the user adhere to the generic functional allocation. Interfaces between the segments should remain relatively constant from application to application. The application vehicle is considered to be an aircraft (e.g. fixed wing, variable geometry, or rotary wing), although the MSS architecture and concepts may be applied to either ground or sea vehicles.

This specification contains specific tailoring instructions for each paragraph. The instructions are contained within the paragraphs, and are identified by blank spaces and/or italicized text. When the tailoring process is complete, the italicized tailoring instructions should have been replaced by application specific text or deleted from the specification. Paragraphs which do not apply to a particular application should not be deleted. They should be identified as "Not Applicable" to maintain paragraph numbering consistency between volumes and various MSS applications.

1. SCOPE

1.1 Identification. This segment specification establishes the requirements for the Instructor/Operator Station segment of the _____ *(insert application aircraft type)* Modular Simulator System (MSS). This volume is one of _____ *(insert number of volumes in the application system/segment specification)* volumes which comprise the _____ *(insert application aircraft type)* MSS system/segment specification. Volume I of this specification contains system level requirements such as MSS structure, communication architecture, network interface performance, system level diagnostic and test requirements, Ada programming language applicability, adaptability and expansibility, and other requirements which pertain to all volumes.

1.2 System Overview. The Instructor/Operator Station (IOS) segment consists of a family of IOS functions and related knowledge that provides the central point of control for the entire simulation and training system activities for the _____ *(insert application aircraft type)* MSS.

As the central point of control for the _____ *(insert application aircraft type)* MSS, the IOS provides the capability to control the general state of the _____ *(insert application aircraft type)* MSS (freeze, reset, etc.), interject malfunctions into the simulation, change parameters within the simulation, plan missions and lessons, monitor the state of the simulation and monitor/measure trainee performance.

The IOS segment interfaces with all other MSS segments as described in the _____ *(insert application aircraft type)* MSS Interface Design Document (IDD) _____ *(insert IDD document number)*. Each of the IOS segment functions identified are processed within the IOS segment.

The IOS segment may be required to operate in one of three different mode combinations: Autonomous, Multiple Simulator Environment (MSE) or both. In the autonomous mode the IOS segment provides all of the above functions required by the _____ *(insert application aircraft type)* MSS. In the MSE mode the IOS segment provides limited IOS functionality. In the MSE mode, the IOS domain does not provide control of environmental parameters that could effect other entities in the environment. The IOS segment accesses all MSE data via the Environment Segment.

The IOS segment consists of the hardware and software elements necessary to manage training and maintenance operations on the MSS. The functions of the IOS begin well before the student arrives for training.

The IOS segment provides the capability to assemble and ready the resources necessary to carry out the training exercise. The IOS segment provides the instructor with the capability to control and monitor the session as training is being conducted. This control includes selection of the desired training session as well as control of simulator unique functions such as freeze, reposition and resume. Monitoring functions include the capability to present to the instructor the status of simulator parameters which have been selected to represent a valid measure of training progress, such as fluids and stores status.

The IOS segment has complete control of the simulator; therefore, it may perform other specific and unique functions. These functions include initiation of maintenance tasks such as daily readiness tests and diagnostics and to control and manage specific test functions such as Hardware/Software Integration (HSI) and/or formal qualification testing up through and including FAA Type Acceptance Testing and Simulator Certification Testing (SIMCERT).

(Specific functions may be added or deleted as necessary for a given application within the constraints that a function cannot be moved between modules. The specific functions which will be implemented in this segment for the application should be listed in this paragraph.)

1.3 Document Overview. This segment specification volume defines unique requirements of the IOS segment for the _____ *(insert application aircraft type)* MSS. It contains descriptions of the functions performed within the segment, communication interface requirements, expandability and adaptability requirements as applicable to the IOS segment.

2. APPLICABLE DOCUMENTS

2.1 Government Documents. The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be the superseding requirement.

The Government documents which are applicable to the entire _____ *(insert application aircraft type)* MSS are listed in Volume I of the system/segment specification. The following Government documents are in addition to those documents and specifically applicable to the _____ *(insert application aircraft type)* MSS.

SPECIFICATIONS:

Federal - *(Identify applicable federal specifications)*
Military - *(Identify applicable military specifications)*
Other Government Agency - *(Identify applicable government standards)*

STANDARDS:

Federal - *(Identify applicable federal standards)*
Military - *(Identify applicable military standards)*
Other Government Agency - *(Identify applicable government standards)*

DRAWINGS: *(Identify applicable drawings)*

OTHER PUBLICATIONS:

Manuals - *(Identify applicable manuals)*
Regulations - *(Identify applicable regulations)*
Handbooks -*(Identify applicable handbooks)*
Bulletins - *(Identify applicable bulletins)*

Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the contracting agency or as directed by the contracting officer.

(In this paragraph list only those documents which are explicitly referenced within this specification. If a requirement paragraph is tailored to reference a system segment specification Volume I paragraph, and that paragraph contains a reference, the document should not be listed here. All requirements and references in system segment specification Volume I are requirements of this specification unless specifically excluded in this volume.)

2.2 Non-Government Documents. The following documents of the exact issue shown form a part of this specification to the extent

specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be the superseding requirement.

The non-Government documents which are applicable to the entire _____ *(insert application aircraft type)* MSS are listed in Volume I of the system/segment specification. The following non-Government documents are in addition to those documents and specifically applicable to the _____ *(insert application aircraft type)* MSS.

SPECIFICATIONS: *(Identify applicable non-government specifications)*
STANDARDS: *(Identify applicable non-government standards)*
DRAWINGS: *(Identify applicable non-government drawings)*
OTHER PUBLICATIONS: *(Identify applicable non-government publications)*

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies.

(In this paragraph list only those documents which are explicitly referenced within this SSS. If a requirement paragraph is tailored to reference a system/segment specification Volume I paragraph, and that paragraph contains a reference, the secondary document should not be listed here. All requirements and references in system/segment specification Volume I are requirements of this SSS unless specifically excluded in this volume.)

3. REQUIREMENTS

3.1 Segment Definition. The IOS Segment shall operate as the single point of system control for the MSS. The IOS Segment shall be responsible for providing the commands required to transition all MSS modules to the desired system modes and states using the interfaces specified in Appendix A of the Interface Definition Document (IDD). The IOS Segment shall also provide a synchronization signal as defined in Volume I of this specification and the IDD.

(This paragraph should be tailored to convey the exact top level functions required of the segment. If this segment is to be used/reused on several devices within a family of trainers, that should be stated here with any unique performance requirements.)

3.2 Characteristics

3.2.1 Performance Characteristics. Performance of the IOS segment shall be as specified herein and in accordance with the _____*(insert application aircraft type)* design criteria. The IOS segment shall provide control of all phases of the MSS training mission, automated maintenance and test functions. Fidelity of the IOS segment shall be sufficient to support the required level of training as specified in Volume I, paragraph 6.1 of this specification.

(When determining what capabilities that the application aircraft MSS IOS should possess the following design considerations should be addressed:

- *a. Required mode of operations (Multiple Simulation Environment, Autonomous, or both)*
- *b. Required ownship flight controls disagreement functions*
- *c. Required navigation/communication status and control functions*
- *d. Required environment status and control functions*
- *e. Required mission status and control functions*
- *f. Required ownship status and control functions*
- *g. Required ownship malfunction functions*
- *h. Required simulator control functions*
- *i Required Student performance monitoring and measurement functions*

Additional text should be added to this paragraph to identify design criteria. A general statement with respect to the fidelity of the simulation should be added.)

3.2.1.1 Segment Modes and States. The IOS segment shall support the modes and states as described in Volume I of this specification. Additional requirements, or operations specific to the IOS segment shall not cause degradation of the system or violate the intent of the system mode or state.

(Introduction of new modes is prohibited. Functions should be accomplished within the established modes and states. This paragraph should be tailored to describe the segment's specific response to a given mode or state. Subparagraphs should be added to identify and define unique segment requirements for each mode and state.)

3.2.1.2 IOS Segment Functions. Functions characterized as "Implemented" shall be implemented to the extent described by the paragraphs dedicated to those functions. Functions characterized as "Not Applicable" shall not exist in this simulation of the _____ *(insert application aircraft type)*, and are not required to be implemented in any form within the IOS segment.

a.	IOS Support Function	Implemented
b.	Ownship Status and Control Function	*(Implemented, N/A)*
c.	Ownship Malfunctions Function	*(Implemented, N/A)*
d.	Ownship Controls Disagreement Function	*(Implemented, N/A)*
e.	Navigation/Communications Status and Control Function	*(Implemented, N/A)*
f.	Environment Status and Control Function	*(Implemented, N/A)*
g.	Mission Status and Control Function	*(Implemented, N/A)*
h.	Simulator Control Function	*(Implemented, N/A)*
i.	Crew Station Performance Monitoring and Measurement Function	*(Implemented, N/A)*

(Each function listed should be characterized as "Implemented" or "Not Applicable (N/A)").

3.2.1.2.1 IOS Support Function. The IOS support function shall provide the segment unique support services required for the operation of the IOS segment in the MSS environment. The IOS support function services shall include the functions listed below and as described in the following paragraphs.

a. Executive Control
b. Initialization
c. MSS VNET (VNET) Communication
d. Diagnostics and Test
e. Backdoor Interfacing
f. Malfunctions
g. Damage Assessment
h. Security Processing
i. Scoring
j. Other Function Support Services

(Service functions are usually incidental to the simulation but no less critical. Examples are overhead and I/O functions. Additional services may be added as necessary to meet specific application requirements. If so, corresponding subparagraphs need to be added below. Do not reuse paragraphs for support services that are not applicable.)

3.2.1.2.1.1 Executive Control. The executive control support service shall provide operational control for the IOS Segment. This control shall include: execution sequencing of all software, mode and state control, and communication between the simulation software and the VNET.

The requirements for executive control performance specific to the IOS Segment include:

a. Graphics Control - The executive control support service shall be responsible for controlling all graphics functions for generation of all data displays and control menu displays.
b. Instructor Input Device - The executive control support service shall be responsible for controlling all instructor input device functions required to interpret and service instructor inputs. The instructor input device functions shall coordinate with the graphics functions to correctly interpret instructor requests.
c. Transition Between Operational Environments - The IOS Segment shall initiate and control the transition between autonomous operation and operation in a Multiple Simulator Environment (MSE). Transition shall be accomplished by sending the MSE Message, via the MSS VNET, to the Environment (ENV) segment to signal a MSE connect/disconnect. Transition between operations shall be oblivious to all other MSS segments. The transition shall be seamless in order to allow transition back and forth without interruption of the training exercise. The IOS Segment shall restrict instructor control capabilities in accordance with function descriptions when a MSE is entered.

(For most applications this paragraph will require no tailoring. If additional or specific executive control functions are required, they should be identified in this paragraph.)

3.2.1.2.1.2 Initialization. The initialization support service shall control initial hardware and software states for the IOS Segment. System initialization shall occur during power-up and system resets, as defined in Volume I of this specification. The initialization function shall also access mission initialization data, and transfer the data to other segment functions for mission initialization.

These initialization requirements include those requirements specified in the initial conditions specified for each IOS segment function. The minimum requirements for initialization in the IOS segment include:

a. Initialization of Graphics Processes. Prior to execution, the hardware specific graphics processor shall be initialized.

b. Initialization of Communications Between Graphics Device and IOS segment. Prior to execution, a communications path shall be established between the IOS segment and the graphics device connection.

(Initialization requirements unique to the IOS segment should be specified in this paragraph. Initialization refers to setting initial hardware and software states during power-up and system resets as defined in Volume I. Instrument scale factors and default instrument settings (usually powered off) are typically initialized by this function. A second initialization function is to access mission initialization data (for example from disc) to pass to other segment functions for mission initialization.)

3.2.1.2.1.2.1 MSS Initial Conditions. The IOS shall control the initialization of the _____ *(insert application aircraft type)* MSS. The initial state of all ownship systems shall be such that the ownship is in a stable state which does not imply a certain mission capability. All quantities (fuel, hydraulic fluid, engine oil, etc.) shall be at the nominal service levels specified for the _____ *(insert application aircraft type)* MSS. All batteries, fire systems and oxygen systems which are simulated shall be in a fully charged state. There shall be no additional stores added to the ownship's normal operating configuration. All weapons stations shall be unloaded and free of any mission ordinance. All malfunctions shall be initially disabled. In this initial state the instructor shall have override capability either manually or by the activation of a specific mission profile initialization.

The ownship controls disagreement function only displays the data received from other MSS segments. There are no initial conditions requirements applicable to the ownship controls disagreement function.

A predetermined set of initial values for each instructor controllable parameter within the navigation/communication status and control function shall be considered the default value for those parameters. In this initial state the instructor shall have override capability either manually or by the activation of a specific mission profile initialization.

A predetermined set of initial values shall be determined for all environment parameters. This initial set shall be considered the default value for those parameters. The predetermined set shall be representative of a standard day atmosphere model without any adverse atmospheric conditions such as winds, storms, etc. Airfield conditions/lighting shall be at a nominal setting. In this initial state the instructor shall have override capability either manually or by the activation of a specific mission profile initialization.

The initial state of the tactical environment shall be an environment void of all moving models and effects of those models, essentially an empty or inactive tactical environment. This shall be the starting condition in autonomous and MSE operation.

The simulator control function shall be independent of a specific mission and shall be activated when the IOS computational system is activated.

(Initialization as used here refers to setting initial hardware and software states during power-up and system reset (i.e. Module Mode and Reset Mode as defined in Volume I). Typical conditions to be initialized are instrument scale factors and default instrument settings (usually powered off). A second initialization function is to access mission initialization data for example from disc to pass to other module functions for mission initialization.

3.2.1.2.1.3 MSS Virtual Network Communication. The MSS VNET communication support service shall provide the IOS segment interface to the MSS VNET. It shall allow communication with other segments in the _____*(insert application aircraft type)* MSS. The IOS segment shall communicate with the MSS VNET in accordance with the protocol requirements defined in the IDD _____ *(insert MSS IDD document number)*.

3.2.1.2.1.4 Diagnostics and Test. The diagnostics and test support service shall provide control for the diagnostic and test functions incorporated into the IOS segment. Diagnostic and test requirements shall be in accordance with the requirements specified herein.

(Based upon the specific simulator diagnostic requirements, all or part of the three types of diagnostic capabilities may be required. "Not Applicable" should be inserted if the specific diagnostic type is not required for the application MSS. Specific diagnostics and their requirements should be listed in each paragraph when applicable.)

3.2.1.2.1.4.1 On-Line Diagnostics. On-line diagnostics shall be provided for the IOS segment. These diagnostics shall be self initiating during start-up and/or as a background function during training mode.

(On-line Diagnostics are those diagnostics that executed while the training system is in the real-time training mode. These diagnostics may run as a background task. An example that would be used in an MSS environment might be a segment functional diagnostic. Each segment would tell the IOS segment that it is still functioning on a periodic basis (say once a minute). If the IOS does not receive the message then it assumes the segment is not functioning properly and provides a message to the instructor.)

3.2.1.2.1.4.2 Off-Line Diagnostics. Off-line diagnostics shall be provided by the IOS segment. Off-line diagnostics shall be

executed when the _____ *(insert application aircraft type)* MSS is not engaged in a system mode.

(Off-line Diagnostics are those diagnostics that are performed on a segment in the stand-alone or segment mode. Typical off-line diagnostics would include; hardware self tests, software tests, I/O debug programs, Daily Readiness at a segment level, etc.)

3.2.1.2.1.4.3 Remote Controlled Diagnostics. Remote Controlled Diagnostics shall be provided for the IOS segment. These diagnostics shall be executed from the Instructor Operator Station (IOS) when the MSS is in the Remote Controlled Diagnostic mode.

(Remote Controlled Diagnostics are those diagnostics that run in the special remote controlled diagnostic mode. These diagnostics require the system to be up and running and the segments communicating. An example of a Remote Controlled Diagnostic would be a real-time debugger.)

3.2.1.2.1.5 Backdoor Interfacing. The backdoor interface support service shall provide the means to support external interfaces to the IOS segment. All ownship IOS system Input/Output (I/O) unless specifically identified in the _____*(insert application aircraft type)* MSS IDD shall interface via the MSS VNET. Backdoor interfaces shall not be utilized for normal intersegment communication.

(Specific backdoor external interfaces should be identified in this paragraph. Backdoor interfaces may include a 1553 bus to communicate with installed aircraft avionics or a specialized interface to provide data to a Training Management System (TMS). A backdoor interface may not be utilized to transmit intersegment data.)

3.2.1.2.1.6 Malfunctions. Not Applicable

(There should be no malfunction defined in the MSS Malfunction Description Document (MDD) for the IOS segment except in most unusual circumstances. This paragraph will normally be tailored as "Not Applicable".)

3.2.1.2.1.7 Damage Assessment. Not Applicable

(If there are damage assessment functions unique to this segment they should be listed here, otherwise identify this paragraph as "Not Applicable". Before defining new functions, be sure the function cannot be incorporated as a variant of an existing function.)

3.2.1.2.1.8 Security Processing. The IOS segment security processing support service shall provide for the processing of the security requirements of the _____*(insert application aircraft type)* MSS IOS segment.

(This paragraph should be expanded to clearly specify which government directives apply, and to what extent, consistent with security considerations. Security processing could include Memory Erase Mode if required and any other security considerations such as removable memory or special encoding devices.)

3.2.1.2.1.9 Scoring. The scoring support service shall provide, during the course of a real-time training exercise, the accumulation of students' raw data from segments in the MSS via the MSS VNET. The data shall be provided to the Crew Station Performance Monitoring and Measurement function of this segment.

(Application specific scoring data requirements for the IOS segment shall be listed in this paragraph. If large amounts of data are required, it may be advisable to provide this to the IOS segment as a non-real-time activity.)

3.2.1.2.1.10 Other Support Function Services. Not Applicable.

(If there are other support functions unique to this segment they should be listed here, otherwise identify this paragraph as "Not Applicable". Intrasegment communication is an example of a function that might be listed in this paragraph. Before defining new functions, be sure the function cannot be incorporated as a variant of an existing function.)

3.2.1.2.2 Ownship Status and Control Function. The ownship status and control function shall provide the instructor/operator with capability to monitor and control systems on the ownship and associated ground support equipment. This function allows the instructor to train crew members in the operation and control of the ownship systems and characteristics in a variety of situations.

The ownship status and control function shall provide a status of ownship systems from the Flight Dynamics, Electronic Warfare, Flight Controls, Flight Station, Navigation/Communication, Propulsion, Radar, and Weapons modules. This status shall include data pertaining to cargo/stores loads, airspeeds, flight control positions, fluid pressures/quantities, electrical loads/voltages, pneumatic systems operations, engine/rotor performance, flight/weapons/navigation computer data, and ground support equipment operational state as applicable to the _____ *(insert application aircraft type)* MSS.

The instructor shall have the ability to reset or adjust parameters of the ownship's systems based on the requirements of the training mission. The instructor shall also have the ability to request the effects of ground support equipment with respect to the ownship including external power, external air or placing the aircraft on jacks.

(The Ownship Status and control function will vary based on the MSS application aircraft and the training objectives. As a minimum the following considerations should be addressed:

a. Slew controls required (altitude, latitude, airspeed, longitude, heading, etc.)
b. Aircraft fuel tanks the IOS will control (left wing, right ring, centerline, left external, right external, etc.)
c. Restorable values the IOS will control (fire agent bottle, oxygen bottle, cabin altitude, cabin temperature, hydraulic fluid quantity, hydraulic fluid pressure, engine oil quantity, engine oil pressure, fuel temperature, brake temperature, battery charge, etc.)
d. Icing conditions the IOS will control (fuselage, engine, tail, wing, rotor, etc.)
e. External connections to the ownship, the IOS will control (external AC power, external DC power, ground cart, boom, aircraft jacks, etc)

This paragraph should be tailored to provide a list of the specific items that will require monitoring and control by the IOS. The requirements of the training missions should dictate which parameters will need to be restorable or adjustable.

3.2.1.2.3 Ownship Malfunction Function. The ownship malfunction function shall provide the instructor/ operator with the capability to interfere with, or interrupt, the normal operational characteristics of the ownship's systems, components and stores.

The ownship malfunction function shall support the malfunctions as described in the MSS Malfunction Description Document (MDD) _____ *(insert MDD document number)*. Malfunctions shall be initiated only thru the IOS.

The result of hostile weapon and structural damage to the ownship shall also be monitored and controllable through this function. The instructor shall have the capability to adjust or override the location and degree of damage to the ownship at any time during the training mission in autonomous operation. The assessment of damage and probability of kill with respect to the ownship shall be capable of instructor override or adjustment.

When the simulator is operating in a Multiple Simulator Environment (MSE), malfunction initiation/removal directions shall be provided to the IOS Segment, via the MSS VNET, from the MSE network manager. Any other malfunctions shall be initiated or removed in accordance with the pre-defined mission plan by the instructor.

(The Ownship Malfunction function will vary based on the application aircraft and the training objectives. As a minimum the following considerations should be addressed:

a. Degraded modes of operation required (malfunctions and/or battle damage)
b. Modes of operation required (MSE, Autonomous, or both)
c. Malfunctions the IOS will insert and remove

d. Battle damage the IOS will insert and remove

Malfunctions may be initiated in other ways than by the instructor. Programmed malfunctions can be used in predefined lesson plans to trigger malfunctions based on aircraft configuration, position or mission time. It is also possible to have self-cancelling malfunctions based on the corrective actions taken by the student, thereby reducing the instructors' workload.

Hostile weapon and damage assessment requirements should be deleted if not applicable to the training objectives. These requirements should be specified in this paragraph.)

3.2.1.2.4 Ownship Controls Disagreement Function. The ownship controls disagreement function shall provide the instructor/operator with a display of the optimal or nominal aircraft control positions required to match the simulated aircraft configuration. This function is used when transferring from a known initial condition to a reposition condition to achieve a smooth transition from an initialized state to the run state.

(The Ownship Controls Disagreement function will vary based on the MSS application aircraft and the training objectives. As a minimum the following considerations should be addressed.

a. Demanded optimum or nominal primary/secondary flight control and throttle positions which should be displayed by the ownship controls disagreement function which will provide for a smooth transition from an initialized state to the run state. These demanded values shall be determined by other MSS segments. These values shall consist of control surface positions and thrust demands.
b. Controls to be manually adjusted after an initialization (e.g. landing gear, flaps, slats, spoilers, wing sweep throttles, speed brakes and trims) should be specified in this paragraph.)
c. Other controls, such as switch positions, can be displayed via this function if required to meet training requirements.

3.2.1.2.5 Navigation/Communication Status and Control Functions. The Navigation/Communication (Nav/Comm) status and control function shall provide the instructor/operator with the information required to monitor and control all navigation and communication functions. These shall include ground navigation aids and ground/airborne communications. This function shall also provide cross country and ground controlled approach map depictions required to complete Ground Controlled Approach (GCA) landings.

The status of the Navigation/Communication segment functions as provided to the IOS Segment by the Navigation/Communication segment shall be monitored. This status shall be used to provide information to the instructor/operator for role playing requirements including responding to students with Air Traffic Control (ATC) communications. When the simulator is operating in

a MSE the student shall be allowed to communicate directly with the appropriate forces or the instructor shall relay the appropriate information to the student. The instructor/operator shall be able to monitor and control all navigation/communication status in order to respond to student actions and mission changes. The fidelity of Navigation/Communication segment outputs shall be capable of being degraded by the instructor/operator to simulate the results of electronic interference/jamming, environmental effects, and tactical effects during autonomous operation. During (MSE) this fidelity degradation shall be disabled at the IOS.

The IOS shall be capable of depicting the pre-programmed mission route expected to be flown by the aircraft. The cross country map depictions shall be capable of showing pre-planned navigation routes, stations, and position fixes for a selected geographic area or as required by a mission profile. The GCA depiction shall provide both a plan and elevation view display with the current status showing the position, altitude, heading and airspeed of the ownship. Track history shall be displayed and a track erase (declutter) capability shall be provided.

The programing of INS waypoints shall be provided for by both canned mission profile and by direct instructor input during autonomous operation. The instructor shall have the ability to enter or change any previously defined waypoints. In order to decrease the time required to align the INS system the instructor shall have the ability to override the INS alignment time.

(The Navigation/Communication control and status function will vary based on the application aircraft and the training objectives. As a minimum the following considerations should be addressed:

a. Intercom circuits the IOS should be able to access (pilot, copilot, crew, private, maintenance, etc)
b. Requirement for radio noise, static and jamming to be inserted into communication/navigation audio circuits
c. Communication/navigation radios that the IOS can monitor (UHF, VHF, HF, TACAN, LF, etc)

This paragraph should be tailored to identify only the requirements for the application aircraft type MSS. For the aircrew training environment, navigation and communication receiver frequencies are normally displayed on a Radio Status Page so that the instructor can quickly identify the student's selections. The requirement for private communications between the instructor and crew members should be identified. The requirements for instructor controlled navigation signals (interference/ jamming, environmental and tactical effect) should also be specified. The ability for the instructor to insert aircraft related data (such as INS waypoints, secure voice codes, etc.) may be a requirement if the aircraft's data insertion device (CDU keyboard, for instance) is not located in the simulated area. The IOS also could have the ability

to graphically replicate an aircraft control or indicator (such as a CDU or instrument). Special capabilities required to maximize training time constraints should be identified. Examples would be INS rapid align or gyro fast erect.)

3.2.1.2.6 Environment Status and Control Function. The environment status and control function shall provide the instructor/operator with the capability to monitor and control physical, meteorological and climatological factors in the ownship environment. The physical features shall include such controls as active runways, airfield/carrier lighting, and runway surface conditions. The meteorological and climatological factors which are controllable by the instructor through this function shall consist of parameters such as winds, temperatures, pressures, thunderstorms and other atmospheric conditions. The IOS will not have the capability to control the environment in a Multiple Simulator Environment operational mode.

The environment status and control function shall allow the instructor to control all aspects of the environment. The extent of the control shall be based on the training requirements. All parameters which have an intensity or brightness adjustment shall be controllable thru an adjustment range of 0 - 10. Where 0 is considered fully off and 10 is considered maximum intensity. All other parameters shall be adjustable or changeable within the ranges and of the units specified in MSS IDD, Appendix A. When the simulator is operating in a multiple simulator environment, this function shall be disabled.

(The Environment control and status function will vary based on the application and the training objectives. As a minimum the following considerations should be addressed:

a. Runway conditions required to be controlled from the IOS (normal, rain, snow, ice, sand, etc)
b. Ambient lighting conditions required to be controlled by the IOS (daylight, dusk, night, dawn, etc)
c. Ambient temperature profiles required to be controlled from the IOS (normal, hot, cold, polar, tropical, etc.)
d. Wind profiles required to be controlled by the IOS (speed, direction, intensity, shear, etc)
e. Weather conditions required to be controlled by the IOS (snow, cloudy, lighting, fog, rain, etc)
f. Turbulence conditions required to be controlled by the IOS (chop, cobblestone, jet upset, rough air, etc.)
g. Visual visibility conditions to be controlled by the IOS (runway visual range, flight visual range, etc)

This paragraph should be tailored to list all aspects of the physical and natural environment that require some form of instructor control. The ranges and units for each parameter shall also be specified in this paragraph.)

3.2.1.2.7 Mission Status and Control Function. The mission status and control function shall allow the instructor to monitor and during autonomous operation, control any aspect of a tactical environment or mission. The instructor shall have the capability to monitor and control the performance of any wing, companion or adversary aircraft and their associated weapons and sensors during autonomous operation.

This same control shall be available to control any ground or water based vehicles in the same manner. The instructor shall have the capability to assess and control any weapons damage done to the vehicles in the tactical environment in autonomous operation.

Computer controlled performance shall be capable of being set at a selectable level from novice to expert. Wing/adversary launched weapons shall also be monitored/controlled as to type, rate of fire, and probability of kill. The IOS shall be capable of controlling the status of hostile fire control radar/jamming signals which can be detected by the ownship sensors, and all controls for ECM effects.

The instructor shall have the ability to control the specific weapons ordinance for each vehicle in the tactical environment. The ordinance control shall allow the instructor to initially specify the ordinance for a tactical vehicle and reset to this initial condition at any time during the mission.

It shall be possible to introduce both ground and water based vehicles into the tactical environment to enhance visual scene fidelity and allow for air-to-ground surface attack simulation. The capability to allow aircraft landings on water vehicles, such as aircraft carriers, shall also be provided.

In order to accommodate a more generic sense to the objects in the tactical environment (i.e., aircraft, ships, tanks, missiles, bombs, chaff, etc.) each object shall be considered as a moving model. The instructor shall have the ability to control parameters which deal with the moving model including positional information, weapons stores/characteristics, radar effects, active sensors/jamming, activation/deactivation of weapons and sensors, radio frequencies, lighting status, and the activation and deactivation of the moving model as a whole.

When the simulator is operating in a MSE, all capabilities to control the tactical and mission environment shall be disabled.

(The mission control and status function will vary based on the application aircraft and the training objectives. As a minimum the following considerations should be addressed:

a. Moving models to be controlled by the IOS for the application, (flares, chaff, bombs, threats, etc)
b. Emitter control capabilities required, (number, power level, frequency, etc)
c. Weapon controls required for the application, (station status, load status, fire status, etc)

This paragraph shall be tailored to identify all aspects of a tactical and mission environment that will require status and control by the IOS segment. The performance parameters that will require monitoring for companion or adversary aircraft should be specified. In a tactical environment, the IOS requirement to have the ability to assess and control any weapons damage should be noted. All instructor capabilities to control weapons shall be addressed here.)

3.2.1.2.8 Simulator Control Function. The simulator control function shall provide the instructor/operator with the capability to control the high level activities which are common to all segments of the MSS. These shall include initialization, alignment, diagnostics, record/playback, etc. This function shall provide the instructor/operator with the capability to transition the simulation between the modes and states defined in Volume I of this specification. In addition to overall simulator control, various simulator subsystems shall be controlled through this function. This shall include motion systems, G-seats, G-suits, visual systems, control loading systems and sound systems. The simulator control function shall also provide the synchronization and timing signal used by all other MSS segments. In general, the IOS Segment, with the help of this function will act as the central controlling mechanism for the MSS.

The simulator control function shall provide to the instructor/operator the ability to control and monitor the following high level control activities for the MSS:

a. Simulator mode and state control and monitoring as defined in Volume I of this specification.
b. Simulation timing and synchronization as defined in Volume I of this specification.
c. Performance/Testing Operations
d. Snapshot/Recall
e. Record/Playback
f. Simulation Speed Multiplier
g. MSE Operation

In addition to these high level control activities, this function shall monitor the operational status of the modules to detect any failures, safety interlock malfunctions, etc.

The state of all simulation systems such as the visual system, control loading system, motion system, sound system, etc. shall be controlled by this function. The control of these systems shall be limited to on/off demands and intensity in the case of sound system. All other demands that the instructor/operator requests upon the visual environment shall be performed by the environment function. This function shall also receive all aircraft crash data in order to determine if a simulation halt is required. When required this function shall provide the control for MSE training and independent crew training applications.

(The simulator control and status function will vary based on the application aircraft and the training objectives. As a minimum the following considerations should be addressed:

a. Visual eyepoints required for the application (pilot, copilot, etc)
b. Training modes required for the application (run, freeze, align, etc)
c. On-line diagnostics capabilities required for the application
d. Quick action tasks required for the application
e. Operational modes required for the application (training, mission generation, shutdown, reset, local diagnostic, remote controlled diagnostic, etc)
f. Off-line diagnostics required for the application
g. Freezable parameters to be controlled by the IOS for the application (flight, position, altitude, pitch, yaw, airspeed, heading, weapons, etc)

The list of IOS high level control activities must be tailored for the application aircraft. The list of simulator systems to be controlled by this function should be identified.)

3.2.1.2.9 Crew Performance Monitoring and Measurement Function. The Crew Performance Monitoring and Measurement function shall provide the capability to access an external training management system or a training system support center through a backdoor interface. This capability shall allow the scheduling of resource allocation, the preparation of instructor/student guides, materials and instructions necessary to carry out the particular training exercise. This access shall allow the instructor/operator to withdraw student information files and select an appropriate already built mission/lesson (canned) or to build a specific mission/lesson based on the needs of the student. The crew station performance monitoring and measurement function will provide the instructor/operator with the capability to monitor and measure the performance of student training. This function shall allow for the collection of information that can enable the instructor to debrief and critique the performance of a student and assign a grade to that performance, data collection for training effectiveness studies and evaluations, and updating the student records with the results of the latest training session.

(The Crew Station Performance Monitoring and Measurement function will vary based on the application aircraft and the training objectives. As a minimum the following considerations should be addressed:

a. Record playback capabilities required for the application (full speed, double speed, half speed, quarter speed, etc)
b. Snapshot/recall capabilities required for the application
c. Aircrew scoring capabilities required for the application (missile, gun bomb drop, navigation, malfunction, etc)

This paragraph shall be tailored to identify the need for the crew performance monitoring function and to briefly describe the types of performance data that needs to be monitored. The size and scope of the crew performance monitoring and measurement function are application specific. Any replication of aircraft controls or indicators (HUDs, MFDs, etc.) should be identified. The requirements for this function shall be specified in this paragraph.)

3.2.2 System Capability Relationships. The IOS segment shall support the system capability relationships defined in Volume 1 of this specification. IOS segment functional relationships shall be described in the following paragraphs.

(Define any IOS segment unique capability relationships. In general, the capability relationships specified in Volume I will suffice for this segment.)

3.2.2.1 IOS Segment Functional Relationships. The top level, typical, IOS segment functional relationships are depicted in FIGURE 1. Each function shall operate in a manner which will allow the segment, as a system, to satisfy the timing requirements described in Volume I of this specification. Functions implemented within the ios segment shall operate in such a manner which will allow the segment to meet both segment and system level requirements without degradation.

(There are two approaches to describing inter-segment interfaces: all functions communicate through the support function, or all functions communicate directly with other functions. One description should be selected and all segments use the same approach. FIGURE 1 in all segments may have the same structure. For this segment, functions which are not implemented should be shaded out. If desired, functions which are only partially implemented may be graphically represented with cross hatching. Note that the intent of this diagram should be to identify "required" internal relationships and not to specify the segments internal design. The tailoring of this paragraph should be done very carefully.)

3.2.3 External Interface Requirements. The IOS segment shall support the external interface requirements defined in Volume I of this specification and the ____ *(insert application aircraft type)* MSS

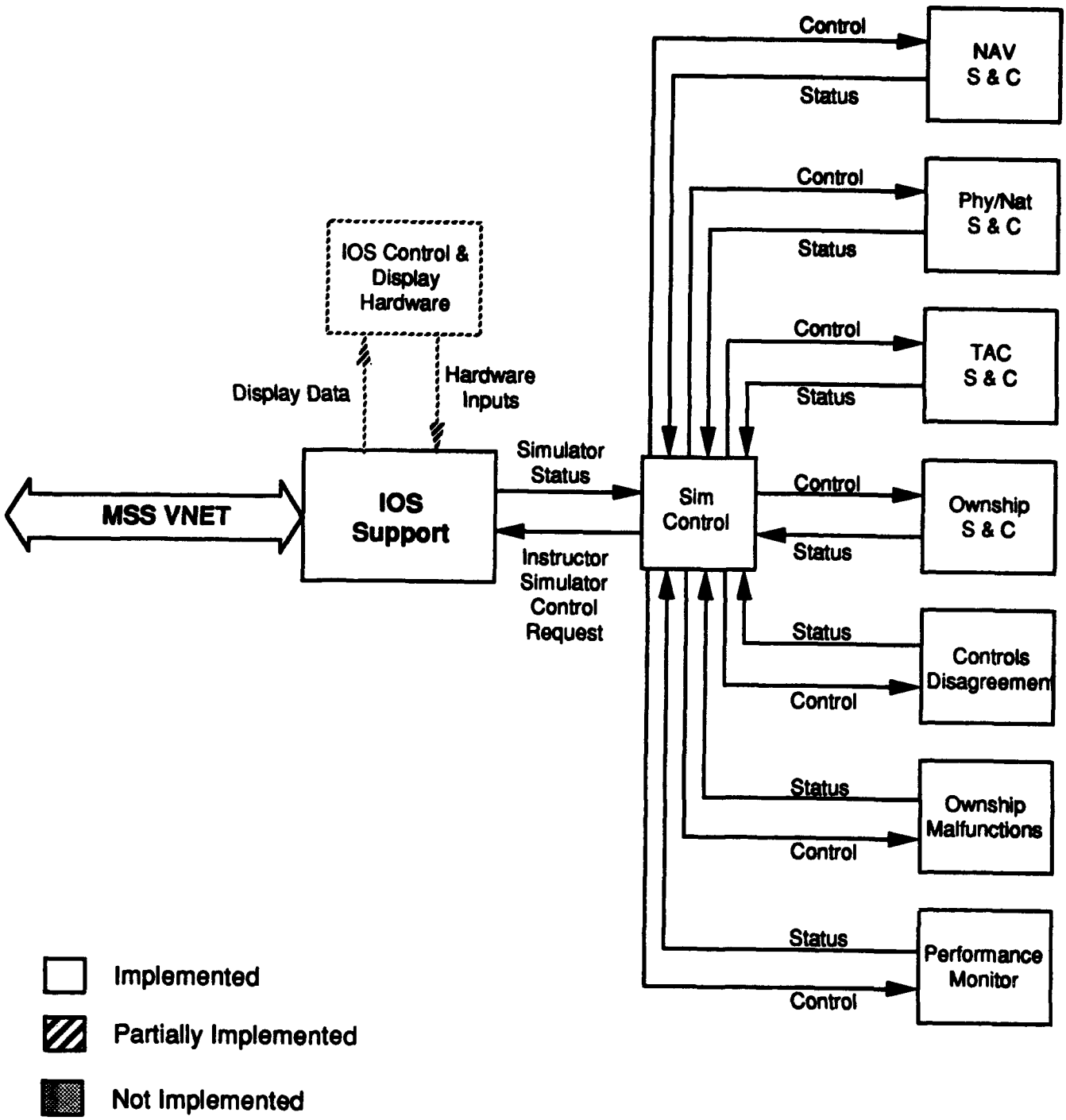

FIGURE 1
INSTRUCTOR/OPERATOR STATION SEGMENT FUNCTIONAL RELATIONSHIPS

Interface Requirements Specification (IRS). External interfaces comprises data passed between functions and the functions of other MSS segments. With the exception of the dedicated interfaces for the cockpit, all other external interfaces which shall be used for the IOS segment are specified in the _____*(insert application aircraft type)* MSS IRS.

(Define any IOS segment unique external interface requirements. External facility interfaces for primary power,cooling, floor space, etc., should be identified here or specifically referenced in Volume I.)

3.2.4 Physical Characteristics. The physical characteristics of the IOS segment shall meet the requirements as specified in Volume I of this specification. The IOS segment physical characteristics shall be of such design as to interface with the other MSS segments via the MSS VNET.

(This paragraph should be tailored to provide a complete list of active controls and indicators for the IOS system functions. Physical characteristics requirements for the IOS segment, other than those provided by the IOS segment computational system and its interface to the MSS VNET shall be defined in this paragraph. Physical characteristic requirements may include backdoor interface hardware to connect IOS segment (I/O) to the application aircraft cockpit. In addition, any weight or size considerations applicable to the IOS segment should be considered.)

3.2.4.1 Protective Coatings. IOS segment protective coatings shall be as defined in Volume I of this specification.

(Additional protective coating requirements which are required for the IOS segment may be defined in this paragraph. In general, the requirements of Volume I should suffice for the entire system.)

3.2.5 IOS Segment Quality Factors

3.2.5.1 Reliability. The system level reliability requirements applicable to all segments in the MSS are defined in Volume I of this specification. The IOS segment reliability must be _____ % to satisfy the system level reliability requirements. The Mean Time Between Critical Failure (MTBCF) shall not be less than _____ hrs.

(A specific allocation of reliability (e.g. MTBCF) for this segment should be specified in this paragraph. Reliability should be allocated to each segment in such a way that system level reliability requirements will be met. Normally this means that segment reliability will be higher than system reliability.)

3.2.5.2 Maintainability. The system level maintainability requirements applicable to all segments in the MSS are defined in Volume I of this specification. The IOS segment shall have a

mean corrective maintenance time, of ____ minutes, and a 90th percentile maximum corrective maintenance time of ____ minutes to satisfy the system level maintainability requirements.

(Maintainability requirements such as Mean Time to Repair (MTTR) should be allocated to each segment in such a way that system level maintainability requirements will be met. Normally this means that segment MTTR will be higher than system MTTR. System level requirements will include isolation to a faulty segment.)

3.2.5.3 Availability. The system level availability requirements applicable to all segments in the MSS shall be as defined in Volume I of this specification.

(Usually, availability applies only to the system level. Reliability and Maintainability (MTBF and MTTR) should be allocated to each segment in such a way that system availability requirements will be met. It would be unusual to impose an availability requirement at the segment level.)

3.2.5.4 Additional Quality Factors. The system level additional quality factors as defined in Volume I of this specification, shall apply to the IOS segment

(Additional IOS segment unique additional quality factors may be defined in this paragraph. In general, the system level additional quality factors requirements will suffice for the IOS segment)

3.2.6 Environmental Conditions. The environmental conditions requirements, as defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique environmental conditions requirements. In general, the system level environmental conditions requirements will suffice for the IOS segment)

3.2.7 Transportability. The transportability requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique transportation requirements. There may exist unique transportation requirements to ship the segment from the segment contractors facility to the prime contractors facility. In general, the system level transportability requirements will suffice for the IOS segment.)

3.2.8 Flexibility and Expansion. The flexibility and expansion requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Unique requirements for this segment may include spare memory, spare time, spare mass storage, I/O channels by type, chassis expansion slots, etc. Expansion requirements should consider the likelihood this segment will need to change as well as the cost of including

capability now versus cost to change later. Reuse of the segment in future applications should also be considered and specified.)

3.2.9 Portability. The portability requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Except for field transportable trainers portability of hardware is usually not a requirement. Portability of software may be a concern for future changes which may include upgrading the Computer Hardware Configuration Item (HWCI) are considered likely. Use of a standard higher order language such as Ada is usually are adequate to assure software portability.)

3.3 Design and Construction. The design and construction requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique design and construction requirements. In general, the system level design and construction requirements will suffice for the IOS segment.)

3.3.1 Materials. The materials requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique materials requirements. In general, the system level materials requirements will suffice for the IOS segment)

3.3.1.1 Toxic Materials. The toxic materials requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique toxic materials requirements. In general, the system level toxic materials requirements will suffice for the IOS segment.)

3.3.2 Electromagnetic Radiation. The electromagnetic radiation requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique electromagnetic radiation requirements, (i.e. IOS CRT). In general, the system level electromagnetic radiation requirements will suffice for the IOS segment)

3.3.3 Nameplates and Product Marking. The nameplates and product marking requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique nameplates and product marking requirements. In general, the system level nameplates and product marking requirements will suffice for the IOS segment)

3.3.4 Workmanship. The workmanship requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique workmanship requirements. In general, the system level workmanship requirements will suffice for the IOS segment)

3.3.5 Interchangeability. The interchangeability requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique interchangeability requirements. In general, the system level interchangeability requirements will suffice for the IOS segment)

3.3.6 Safety. The safety requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique safety requirements, (i.e. emergency power off, control loading on/off, g-seat on/off, g-suit on/off and motion system on/off switches). Safety related switches available to the instructor should remain operational during a freeze state. In general, the system level safety requirements will suffice for the IOS segment)

3.3.7 Human Engineering. The human engineering requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(When tailoring of this paragraph is accomplished it should be important to note that the IOS should act as an interface to the task(s) that need to accomplished and control of the training device.

The following considerations should be addressed concerning the specification of the IOS segment. These are addition to the system level human engineering factors.

a. Users of the IOS, (maintainers, instructors, students and/or developers)
b. Information needed to be displayed for maintainers, (diagnostic testing, daily readiness, simulator certification, etc)
c. Information needed to be displayed for instructors, (instructional delivery, training control, training monitoring, evaluation, etc)
d. Information needed to be displayed for system developers, (simulator control target developers, HW/SW development, HW/SW integration, simulator experimentation, etc.)
e. Type of input devices (keyboards, mouse, touchscreen, remote keypads, joy stick, etc)
f. Skill level of users (new, advanced, etc)

3.3.8 Nuclear Control. The nuclear control requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique nuclear control requirements. In general, the system level nuclear control requirements will suffice for the IOS segment)

3.3.9 Segment Security. The system security requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique security requirements. In general, the system level security requirements will suffice for the IOS segment)

3.3.10 Government Furnished Property Usage. Government Furnished Property (GFP) shall be as defined in Volume I of this specification.

(Identify any IOS segment unique GFP requirements. In general, the system level GFP usage requirements will suffice for the IOS segment)

3.3.11 Computer Resource Reserve Capacity. The system level reserve capacity requirements applicable to all modules in the MSS are defined in Volume I of this specification. As a minimum, in addition to the processing resources identified in Volume I, the specific processing resources for the IOS Segment shall include the computational system hardware, graphics display system hardware, and software required to design, develop, and test the IOS Segment.

(In addition to the computer resource reserve capacity identified in Volume I, the specific reserve capacity for the IOS segment may include the computational system hardware and software required to design, develop, and test the IOS segment. System considerations such as spare (time, memory, storage, I/O channels) for growth unique to this segment should be imposed here. If this paragraph requires subparagraphs they should follow the numbering and topics used in Volume I.)

3.4 Documentation. This paragraph shall specify the requirements for IOS Segment documentation i.e. specifications, drawings, technical drawings, technical manuals, test plans and procedures, and installation instruction data.

(Identify any IOS segment unique documentation requirements. Documentation requirements for the IOS segment may include interface specifications, user guides and design data for interfacing to an embedded piece of cockpit equipment. In general, the system level documentation requirements will suffice for the IOS segment.)

3.5 Logistics. The logistics requirements for the IOS Segment shall be as specified in Volume I of this specification, paragraph 3.5 and all subparagraphs of paragraph 3.5.

(Unique support requirements for this segment should be described here. These may include special tools and jigs for installation, alignment and calibration; special environmental conditions for operation and repair such as a clean-room for component repairs; levels and types of spares required.)

3.6 Personnel and Training. The system level personnel and training requirements, defined in Volume I of this specification, shall apply to the IOS segment.

(Identify any IOS segment unique personnel and training requirements. Usually some requirement will be levied concerning IOS user training. In general, the system level personnel and training requirements (number, skills and training for user personnel.) will suffice for the IOS segment.)

3.7 Subordinate Element Characteristics. Not Applicable.

(This volume defines requirements for a subordinate element of the MSS. In general, there will be no subordinate elements of a segment.)

3.8 Precedence. The precedence requirements for the IOS Segment shall be as specified in Volume I of this specification.

4. QUALIFICATION REQUIREMENTS

4.1 Responsibility For Test and Inspection. The _____*(insert application aircraft type)* MSS responsibility for test and inspection requirements are defined in Volume I of this specification. The requirements defined in Volume I shall apply to the IOS segment.

(This paragraph may be tailored to identify additional test or inspection requirements which are specific to the IOS segment)

4.2 Special Tests and Examinations. The system level general qualification events, levels, and methods of testing for the IOS segment are defined in Volume I of this specification. The requirements defined in Volume I shall apply to the IOS segment.

(Clearly identify which test events defined in Volume I apply to this segment. Be particularly explicit about the segment builder's responsibility during system integration and test. However, in some cases, verification can only be achieved in the integrated mode. A clear definition of the segment supplier's responsibility during systems integration should be contained in the SOW.

This paragraph may be tailored to identify additional test or inspection requirements which are specific to the IOS segment. The following paragraph is an example of a special test that may be required to be initiated from the IOS depending on the application aircraft specific verification requirements.

Autotests are initiated from the IOS for the purpose of segment and integrated performance and maintenance testing. Autotest provide repeatable results in a much shorter period of time than pilot in the loop tests. This may be for acceptance testing or simulator certification. The types and extent of test to be included will be driven by the support concept and availability requirements of the system and their allocation to this segment. Autotest may be used for acceptance by the procurement agency and certification by the user or FAA (SIMCERT/AC120-40).

Responsibility for integrated tests should be minimized at the segment level. If the segment is required to pass an integrated test, as part of its acceptance, that test(s) should be called out here. Additional tests might include segment compliance tests which can only be performed with the segment installed as part of a system. These should be identified here and the requirements detailed by adding subparagraphs.)

4.3 Requirements Cross Reference. A requirements compliance cross reference matrix shall be developed to ensure requirement traceability. The requirements cross reference matrix shall be included as part of the _____ MSS Prime Item Development Specification (PIDS).

5. PREPARATION FOR DELIVERY. The _____*(insert application aircraft type)* MSS preparation for delivery requirements, as defined in Volume I of this specification, shall apply to the IOS segment.

(Segment unique requirements may include packaging the segment for shipment to the integration location which could be different than packaging the system for shipment to the installation site. If requirements are imposed here, there may be test requirements for verification which must be added to Section 4.)

6. NOTES

6.1 Intended Use. The _____ *(insert application aircraft type)* MSS shall be used as an integral part of the _____ *(insert application aircraft type)* aircraft training system.

6.1.1 Missions. The IOS segment shall support the mission requirements, as described in paragraph 6.1.1 of Volume I of this specification. It shall provide the IOS portion of simulation and training in cockpit familiarization, flight characteristics, operating procedures, and mission procedures for the _____*(insert application aircraft type)* MSS. The IOS shall assist by controlling and monitoring the trainee performance as he becomes familiar with the cockpit configuration and flight characteristics of the aircraft, gains proficiency in executing normal procedures, in recognizing malfunctions/abnormal indications and executing the corresponding emergency procedures, and in executing mission procedures. Personnel using the IOS may range from entry level students performing in a self paced arena to fully qualified instructor pilots,to maintenance technicians to design engineers.

(The IOS segment mission is to support the trainer mission as described in Volume I. Any mission specific information should be described in this section. An example would be a segment intended to support a family of trainers such as a procedures trainer, part-task trainer, flight trainer, or weapons system trainer.)

6.1.2 Threat. Not applicable

(This paragraph shall describe the threat which the system is intended to neutralize. In this context, this paragraph is not applicable to most simulators, and will generally remain "Not applicable".)

6.2 IOS Segment Acronyms. The acronyms contained in this paragraph are unique to the IOS segment and are in addition to the MSS acronyms contained in Volume I of the specification, paragraph 6.1.

ATC	Air Traffic Control
DOD	Department of Defense
ECM	Electronic Countermeasures
ENV	Environment
GCA	Ground Controlled Approach
H/W	Hardware
HSI	Hardware/Software Integration
INS	Inertial Navigation System

I/O	Input/Output
IOS	Instructor/Operator Station
IRS	Interface Requirements Specification
MSE	Multiple Simulator Environment
MSS	Modular Simulator System
N/A	Not applicable
TMS	Training Management System
T.O.s	Technical Orders
VNET	Virtual Network

6.3 Glossary of Propulsion Segment Terms. The terms contained in this paragraph are unique to the IOS segment and are in addition to the MSS terms contained in Volume I of this specification, paragraph 6.3.

AIRCRAFT CONFIGURATION - The set of conditions that describes the positions of surfaces, aircraft geometry, aircraft landing gear, aircraft weapon load and aircraft systems health statuses.

AMBIENT LIGHTING - The natural or surrounding lighting external to the air vehicle.

AUTONOMOUS - The simulation environment involving the stand-alone operation of a trainer in a training exercise.

CREW STATION - the area of the vehicle in which the flight crew resides.

CREW STATION PERFORMANCE MONITORING AND MEASUREMENT - A function within the IOS segment that provides the instructor with the capability to monitor and measure the performance of the crew member's training.

ENTITIES - Objects in the environment external to the ownship such as other aircraft, ships, weapons, tanks, missiles, dismounted infantry, etc.

ENVIRONMENT - Segment which provides for the simulation and modeling of the tactical and natural conditions outside of the ownship.

FUNCTION - A logically separate unit of operation which collectively or individually define a system with distinct input and output parameters.

GRAPHICS DEVICE/MONITOR - A specialized computer having one or more processors dedicated to graphics processing with a display device, or monitor.

INSTRUCTOR - The person ~~who's~~ whose primary function is to teach or instruct the trainee in the operation and missions of the aircraft. The instructor is the main user of the IOS.

LESSON - An assignment or exercise in which something is to be learned. Consists of a course of instruction.

MALFUNCTION - The simulated erroneous operation or behavior of a system, instrument, device, or process.

MISSION - A preplaned scenario that is used to train students to accomplish the same or similar task in a trainer as in the application aircraft.

MISSION STATUS AND CONTROL - A function within the IOS segment that provides the instructor the capability to monitor and control the entire tactical and mission environment. This would include external air, ground, and water vehicles, emissions, threats, electronic warfare, etc.

MOUSE - A hand-held tracking device used to interact with a computer. The device usually has from one to five buttons for additional input capability.

MULTIPLE SIMULATOR ENVIRONMENT (MSE)- The simulation environment involving the networking of various simulators in one training exercise. It can also refer to the present state of the ownship simulation, either autonomous or multiple simulator operation.

MULTIPLE SIMULATOR NETWORK MANAGER - The person or system that coordinates the multiple simulator environment including the addition/deletion of participants in the training exercise.

NAVIGATION/COMMUNICATION - The simulation of the navigation, communication and identification systems for the application aircraft.

NAVIGATION/COMMUNICATION STATUS AND CONTROL - This segment provides the instructor/operator with the capability to monitor and control all navigation and communication related parameters within the ownship and environment.

OWNSHIP CONTROLS DISAGREEMENT - This segment provides the instructor/operator with a display of the optimal or nominal control positions in order to allow the trainee to configure the crew stations to match the simulated configuration. This function is used when transferring between training device states.

OWNSHIP MALFUNCTIONS - This segment provides the instructor/operator with the capability to interfere with, or interrupt, the normal operational characteristics of the ownship's systems, components and stores.

OWNSHIP STATUS AND CONTROL - This function provides the instructor/operator with the capability to monitor and control systems on the ownship and associated ground support equipment. this capability includes actions such as system resets, adjustments of position or fuel quantity and variation of other simulator parameter specifically applying to the ownship.

PARAMETER - A variable or element used to represent a real world value in a mathematical or logical expression.

SIMULATOR CONTROL - A function within the IOS segment that provides the instructor with the capability to control the simulator.

STATUS AND CONTROL - The capability to monitor and control systems. This capability includes actions such as system resets, adjustments of position or fuel quantity and variation of other simulator parameters.

SUPPORT - Provides the segment unique services required for the operation of the segment in the simulator environment. This includes executive control, initialization, communication with other segments, devices, and systems, malfunctions, security, and trainee scoring.

TRAINEE - Both experienced and inexperienced students undergoing refresher and initial training.

TRAINING DEVICE - A tool or set of tools that aids in the process of instruction of trainees.

TRAINING SYSTEM - A collection of training devices with common or related tasks.

VIDEO DISPLAY TERMINAL - A raster monitor to display video or graphics processor output.

ACTIVE PAGE RECORD

PAGE NO.	REV LTR	ADDED PAGES				PAGE NO.	REV LTR	ADDED PAGES			
		PAGE NO.	REV LTR	PAGE NO.	REV LTR			PAGE NO.	REV LTR	PAGE NO.	REV LTR
XII-1	D										
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XII-31	D										
XII-32	D										
XII-33	D										
XII-34	D										
XII-35	D										

REVISIONS

LTR	DESCRIPTION	DATE	APPROVAL
A	BMAC-STS-86-303-1 Total revision required to incorporate changes required by testing/validation efforts and Government comments.	90/01/11	Prepared By
		90/01/11	Checked By
		91/01/14	Dwg. Qual.
		90/01/11	Supervised By
		91/01/15	Approved By
B	CCP HSV-H91-008 Total revision required to incorporate changes resulting from addition of two new specifications and new functional allocation. Damage Assessment and Scoring were added to the module support function. Autonomous/Multiple Simulator Environment (MSE) operation added to list of high level control activities. Locks and Freezes Verification was added to the stand-alone module test for the MSE. The Ownship Malfunction function was disabled in MSE. The control portions of the Physical/Natural Environment Status & Control and Tactical & Mission Environment Status & Control functions were disabled in a MSE. Fidelity degradation was disabled for the MSE in the Navigation/ Communication Status & Control function.	91/06/24	Prepared By
		91/06/26	Checked By
		91/06/26	Dwg. Qual.
		91/06/27	Supervised By
		91/06/27	Approved By

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REVISIONS

LTR	DESCRIPTION	DATE	APPROVAL
C	CCP HSV-H91-008 Total revision required to incorporate Government comments on document.	91-09-26 91-09-26 91/09/26 91-09-26 91-10-08	Prepared By Checked By Dsg. Qual. Supervised By Approved By
D	CCP HSV-H91-017 This specification volume has been totally revised to: 1. Change the format to comply with DI-CMAN-80008A. 2. Incorporate the tailoring instructions into the body of the text. The incorporation of tailoring instructions into each specification volume has caused a change in the number of specification volumes from fourteen to thirteen. Prior to this change, all tailoring instructions were provided in Volume XIII and Volume XIV contained the Tactical and Natural Environment segment specification. The content of Volume XIII has been integrated into the other specification volumes. The change is summarized as follows: Volume / IS / WAS I through XII — Titles for these volumes are unchanged XIII — Environment — Tailoring Instructions XIV — "Deleted" — Tactical and Natural Environment	93-08-23 93-08-23 93-08-23 93/08/24	PREPARED CHECKED SUPERVISED APPROVED

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